CRAFT Tech, Inc.

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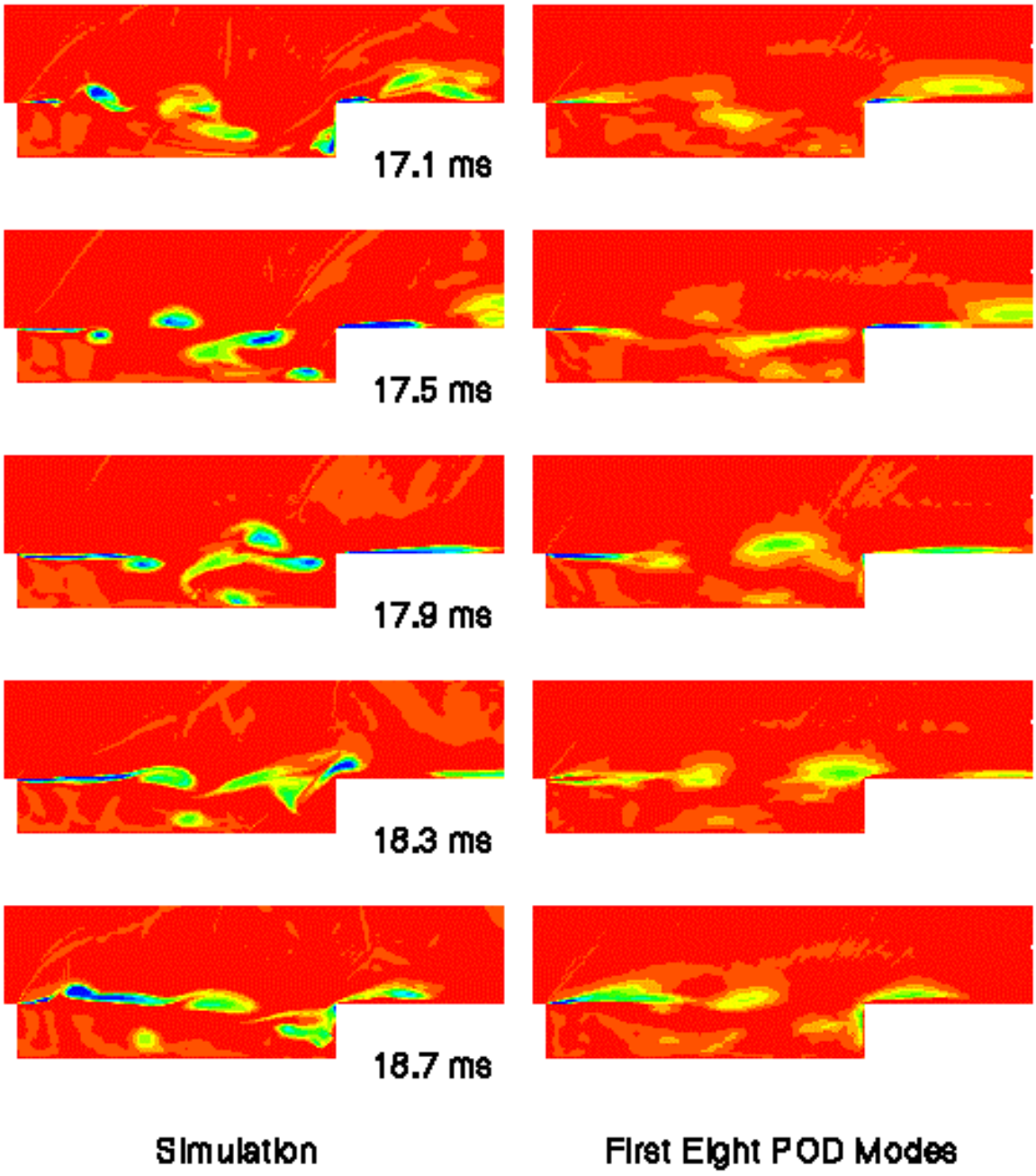
Under AFOSR sponsorship, Combustion Research & Flow Technology, Inc. (CRAFT Tech) & National Center for Physical Acoustics (NCPA) at University of Mississippi are designing an Active Flow Control technique for attenuation of flow induced pressure oscillations in aircraft internal weapons bay. The active control method is based upon utilization of Proper Orthogonal Decomposition (POD) to design a Low Dimensional Flow Controller. The flow control model is derived by projection of the Navier Stokes equations upon POD modes extracted from high resolution Large Eddy Simulation (LES) of the cavity flowfield. The numerical modeling is being complemented by optical diagnostics including three-component PIV, Phase-Averaged Schlieren, etc. to provide direct correlation of turbulence spectra with pressure fluctuations. The figure below shows LES predictions of vortex shedding phenomena during a typical flow oscillation cycle in a cavity and is compared with the corresponding POD reconstruction of the transient vorticity field. The reconstruction was performed using only 8 POD modes and appears to have sufficient fidelity for evaluating application of candidate active control strategies.



LES Predictions and POD Reconstruction of Vortex Shedding during a flow oscillation cycle in a rectangular cavity (L/D=6 at Mach=1.5)